

TITLE OF THE INVENTION

FLUID DIELECTRIC VARIABLE CAPACITOR

[0001] This is a Divisional application of U.S. Application No. 10/323,917, filed December 20, 2002, ^{now U.S. Patent No. 6,690,568} which is a continuation of International Application No. PCT/US01/18702, filed on June 11, 2001, which, in turn, claims benefit of U.S. Application No. 60/212,738, filed June 20, 2000, the contents of all of which are incorporated herein in their entirety.

BACKGROUND OF THE INVENTION

[0002] The present invention generally relates to the field of variable capacitors. More particularly, the present invention relates to a novel liquid filled variable capacitor that operates at high frequency and high RF power.

[0003] Variable capacitors are used in a variety of different capacities and come in a number of different forms. An area of particular importance, in terms of the utility of variable capacitors, is the field of semiconductor RF fabrication apparatus in which an RF field is provided to establish a plasma with which various fabrication processes can be carried out. In such apparatus, RF power is supplied from a source to an electrode that is in communication with a plasma region within a chamber. Variable capacitors are used in RF power match networks to match the impedance of the electrode and the plasma, constituting an electrical load, to the impedance of a source which delivers RF power to the plasma. The purpose of a match network is to increase the energy transfer efficiency between the load and the source. If the impedance match is sufficiently accurate, a measurement of the capacitor value could provide an accurate measure for the RF load. There are several different plasma procedures to be considered in the general application of wafer processing: plasma etching, plasma deposition, plasma photo-resist stripping, ion sources implantation, plasma chamber cleaning, etc. The plasma for each of these procedures will have a different RF load associated with it.

[0004] The current trend in the plasma equipment industry is toward higher frequencies and higher RF powers to sustain the plasma. Many common RF designs use